



Future directions for the Committee on Road Tunnels

Future TC C.4

Former TC 3.3

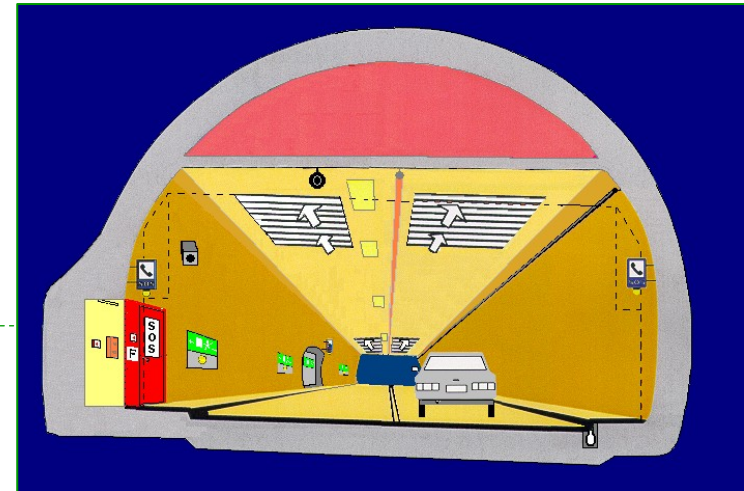
✓ On behalf of the Committee

✓ Manuel Romana-Ruiz

✓ Secretary of spanish expression

✓ Pierre Schmitz

✓ Secretary of french expression



Future directions for the Committee on Road Tunnels Operations

- ✓ Issue C.4.1
 - ✓ Manage and improve **tunnel safety**
 - ✓ Issue C.4.2
 - ✓ Improve **tunnel operation** and maintenance
 - ✓ Issue C.4.3
 - ✓ Optimise **tunnel ventilation** and mitigate fires
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- ✓ Issue C.4.4
 - ✓ Evaluate, systematize and communicate **knowledge on tunnel operation and safety**

Manage and improve tunnel safety

- ✓ Identify priorities and methods for improving **safety in existing tunnels**, including **infrastructure**, prevention and **operation**
- ✓ Finalize the study of **responsibilities in tunnel safety** management, including organisation of tasks and necessary skills
- ✓ Develop recommendations for **risk analysis** and investigate strategies for risk evaluation
- ✓ Investigate harmonised means to **influence users' behaviour** in tunnels

Manage and improve tunnel safety

- ✓ Report **summarising the priority areas** on the basis of cost-effectiveness and describing the practicalities of delivering improvements
- ✓ Recommendations on organisation and **procedures for tunnel safety** management, including role and skills of players
- ✓ **Guidelines for risk analysis** and state-of-the-art of risk acceptability
- ✓ **Guidelines on drivers' education** and real-time communication with tunnel users

Manage and improve tunnel safety

- ✓ We are always going to have accidents
- ✓ Accidents in tunnels are less in number than in open roads
- ✓ There is a public concern about accidents in tunnels because
 - ✓ Escape difficulties
 - ✓ Fear of closed spaces



**Phuket,
September 16, 2007**

Manage and improve tunnel safety

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**Madrid,
September 16, 2007**



Safety in tunnels

is a multivariate question not so easy to achieve using simple means

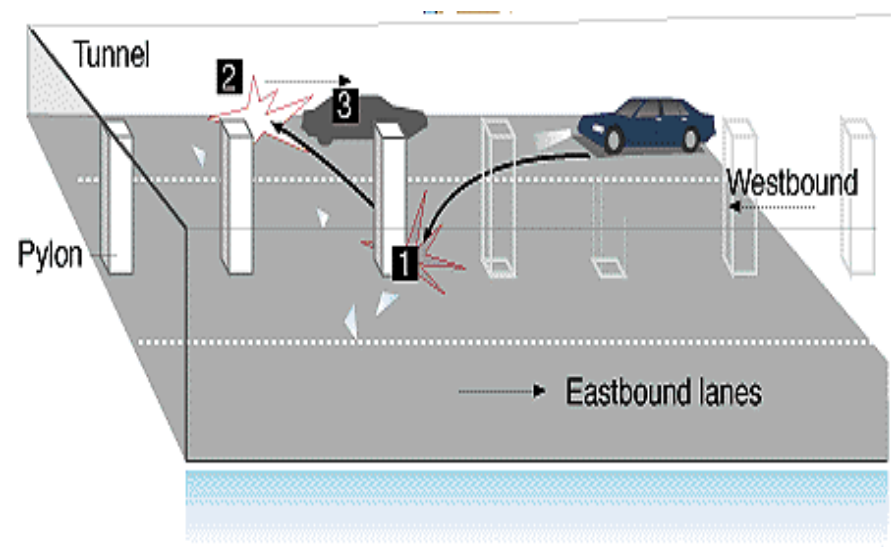
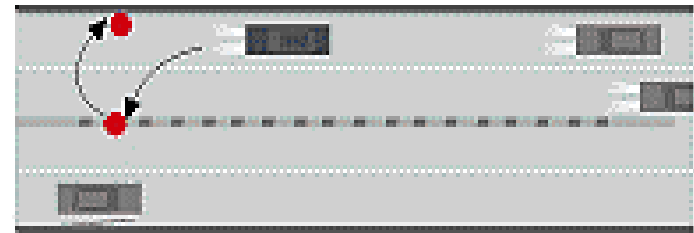
- ✓ It depends on:
 - ✓ User
 - ✓ Operation
 - ✓ Infrastructure
 - ✓ Vehicles



Let us analyze an accident in a tunnel

- ✓ A car enters an urban tunnel at more than 100 Kph
- ✓ The driver has drunk
- ✓ The car crash against a column
- ✓ The passengers don't wear their safety belts
- ✓ They die

- 1** The car struck a mid-tunnel cement pylon
- 2** crossed the lanes, hitting the opposite wall
- 3** and ended up facing oncoming traffic



Whose fault is it?

- ✓ **Of course the driver's**
 - ✓ Alcohol
 - ✓ Too much speed
- ✓ **Also the passengers'**
 - ✓ No safety belt
- ✓ **Perhaps the car's?**
 - ✓ Too "soft"? Too "hard"?
- ✓ **And infrastructure?**
 - ✓ **No protection of the column, like this one**



Improve tunnel operation and maintenance

- ✓ Develop procedures to **improve tunnel operation** based on training, exercises, and analysis of incidents, traffic and maintenance
- ✓ Benchmark experience on **tunnel inspection and maintenance** organisation

Improve tunnel operation and maintenance

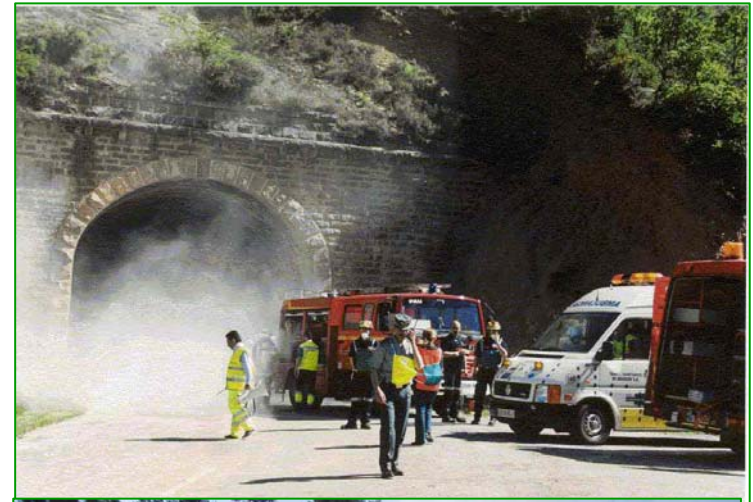
- ✓ **Guidelines on tunnel staff and emergency teams training**, exercises and feedback from operation and incidents
- ✓ **Recommendations on management of maintenance and inspections**

Emergency teams training is necessary and sometimes results are surprising

- ✓ Fire test in a real tunnel in Spain
- ✓ As a part of training of new fire-fighters

→
✓ The vehicle is parked near the tunnel entrance

✓ And the men have to leave because of fumes! →



Optimise tunnel ventilation and mitigate fires

- ✓ Update the demands for ventilation further to new reductions of pollutant emissions and consideration of new pollutants
- ✓ Investigate **fire test data** and new regulations in order to finalize the update of design fires
- ✓ Follow up new developments of **fixed fire fighting systems** and their application

Optimise tunnel ventilation and mitigate fires

- ✓ New data on vehicle pollutant emissions, including new pollutants, and **recommendations on ventilation systems**
- ✓ Updated **recommendations on design fires** for road tunnel ventilation
- ✓ Guidelines on applicability, cost-effectiveness and operation of **fixed fire fighting systems**

Fixed fire fighting systems in tunnels

- ✓ **Controversial issue (because of lack of mutual information?)**
- ✓ **Several countries always use FFFS**
 - ✓ Australia
 - ✓ Japan
- ✓ **Some other tunnels**
- ✓ **PIARC has been negative about them**
- ✓ **Things are changing**



Water spray systems in a Japanese tunnel

Fixed fire fighting systems in tunnels are becoming more common



Test in Japan



Test in The Netherlands



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 - ✓ Please think on these issues and participate in the discussion
- THANK YOU FOR YOUR ATTENTION**